

(12) UK Patent Application (19) GB (11) 2 098 852 A

- (21) Application No 8207205
(22) Date of filing 11 Mar 1982
(30) Priority data
(31) 62357
(32) 13 Mar 1981
(33) Israel (IL)
(43) Application published 1 Dec 1982
(51) INT CL³ A42B 3/00
(52) Domestic classification A3V 11C6 11D B5A 1R214D 1R314C2B 1R449 2H5 T11P
(56) Documents cited GB 0839453
(58) Field of search A3V B5A
(71) Applicant Orlite Engineering Co Ltd Industrial Zone A Nes Ziona Israel
(72) Inventors
- Eliezer Ben-Hillel
Nadav Ben Arie
Haim Krinen
Azriel Kadim
(74) Agents Marks and Clerks 57/60 Lincoln's Inn Fields London WC2A 3LS
- (54) Protective helmet and method for method for manufacture thereof
- (57) A protective helmet comprising a multiplicity of partially overlapping layers of reinforcing material arranged about a center and moulded into a helmet configuration.

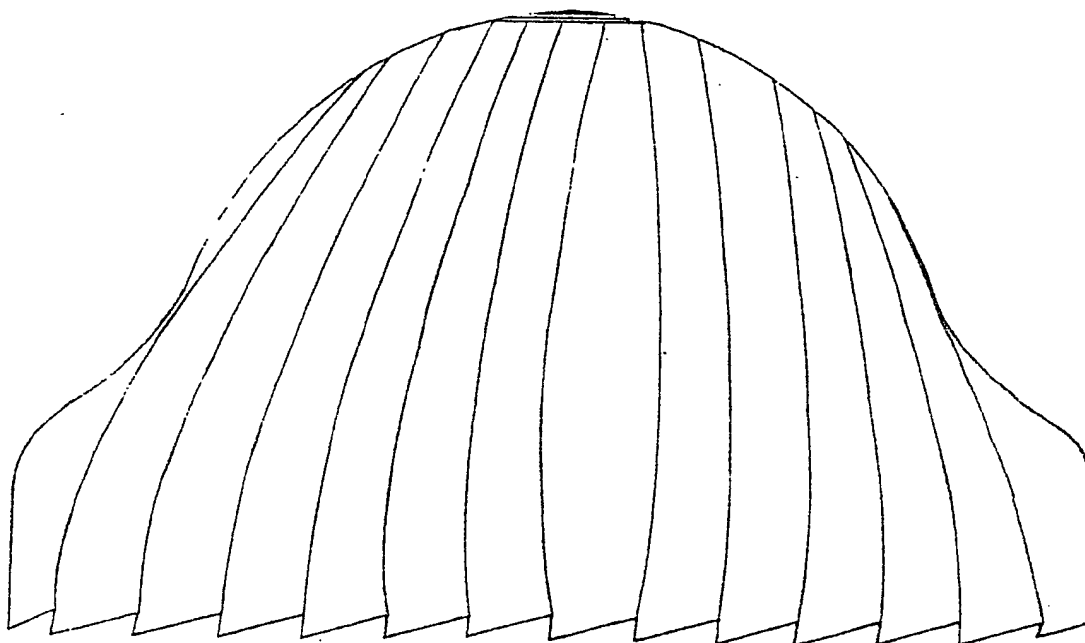


FIG. 3

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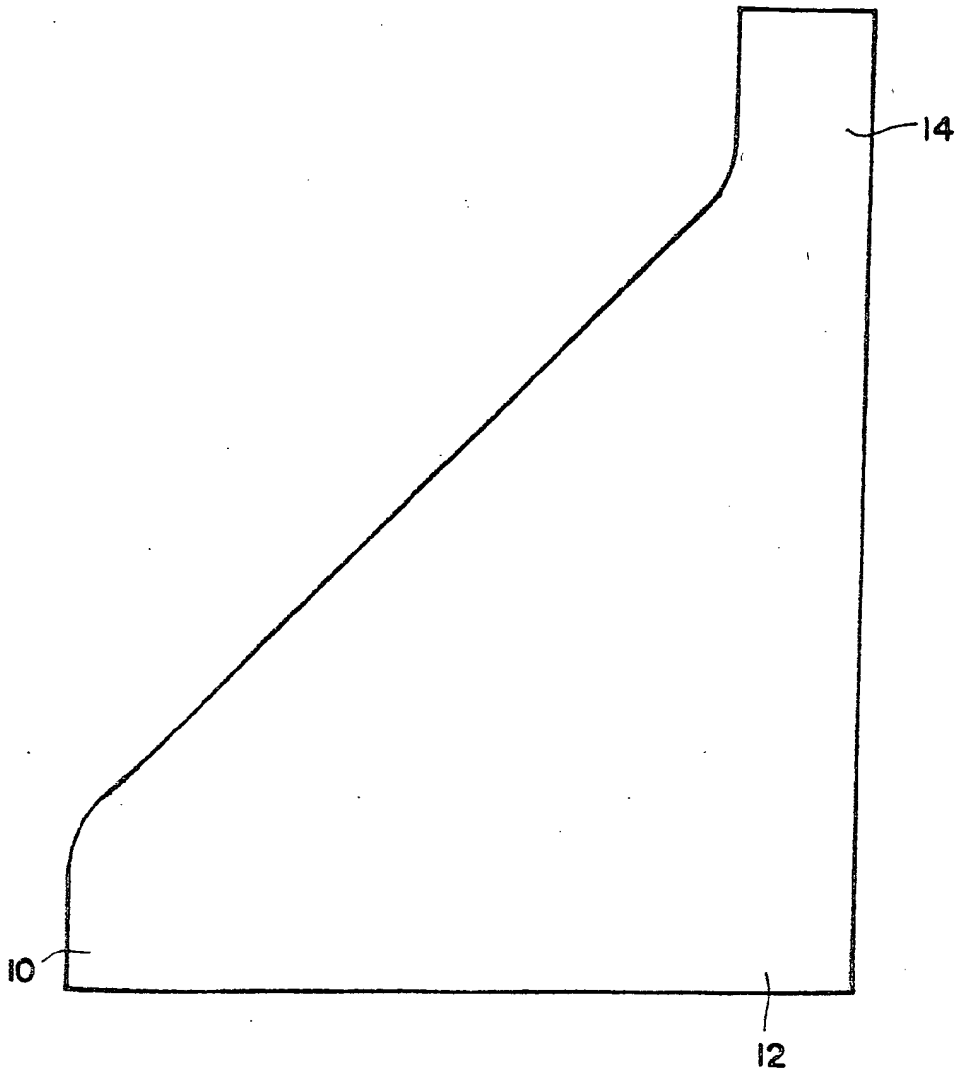


FIG. 1

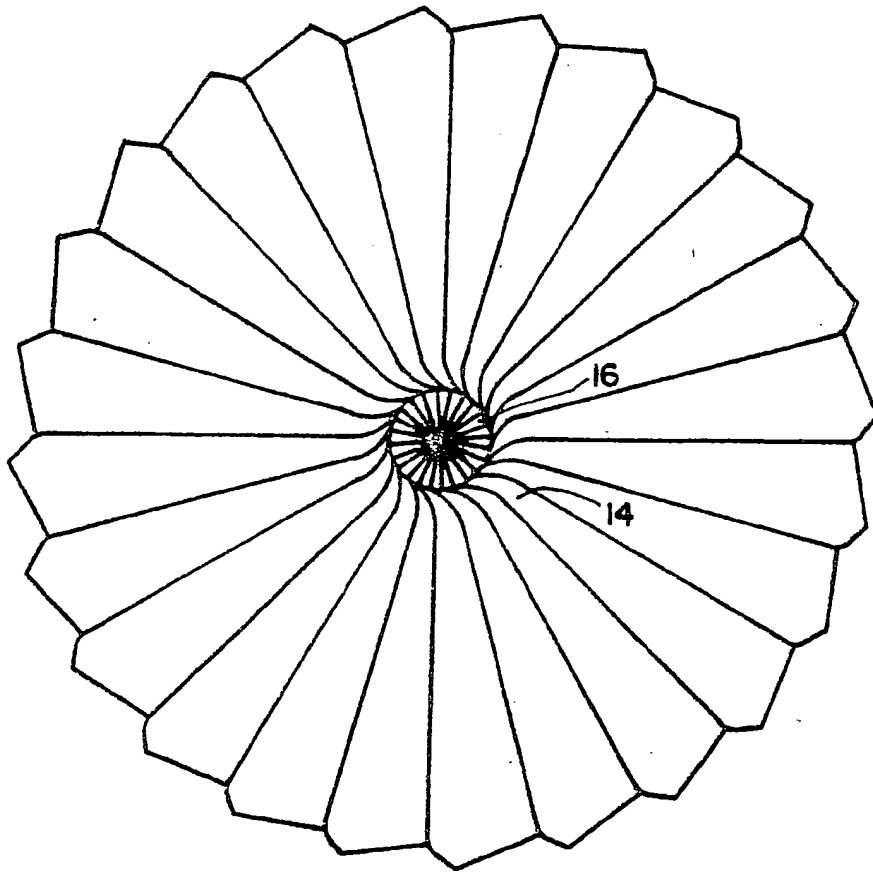


FIG. 2

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FIG. 3

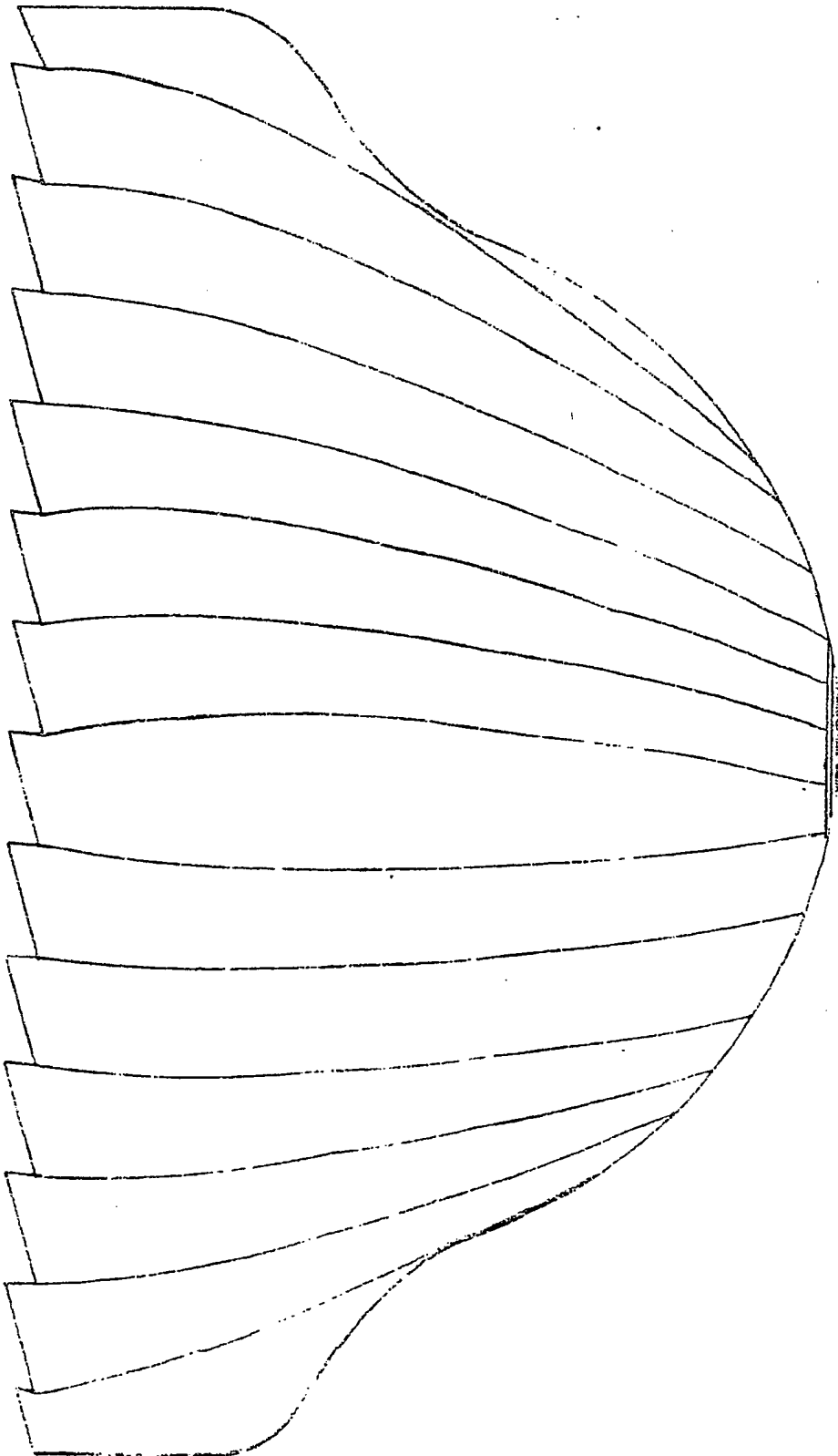
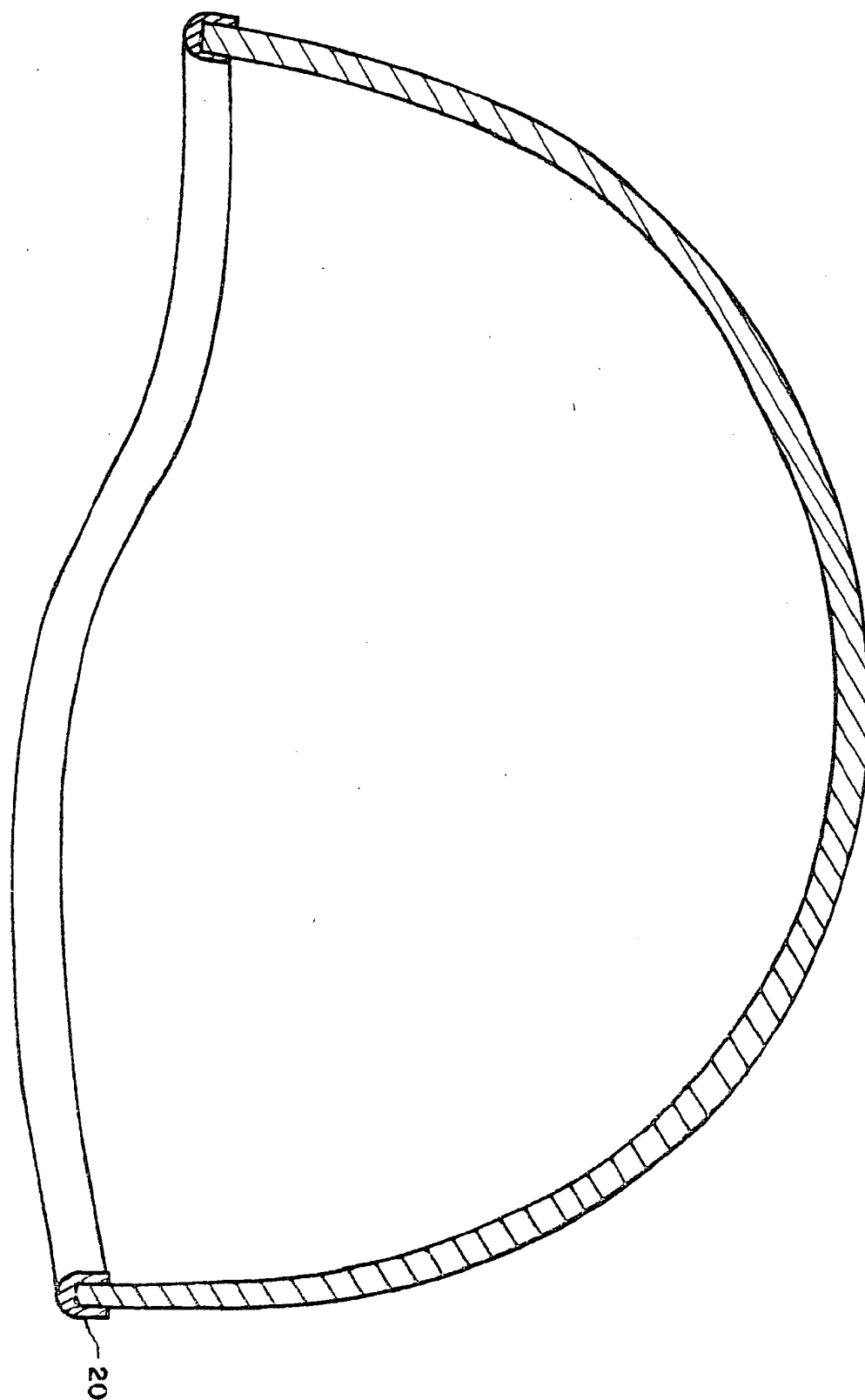


FIG. 4



SPECIFICATION

Protective helmet and method for manufacture thereof

FIELD OF THE INVENTION

The present invention relates to protective helmets and more particularly to protective helmets formed of reinforced plastic materials and to methods for the manufacture thereof.

BACKGROUND OF THE INVENTION

It is known to manufacture protective helmets from reinforced plastic. Such helmets are currently manufactured and sold by the applicant and comprise a plurality of layers of reinforcing fabric and a binding plastic resin. It may be appreciated that since the reinforcing fabric is cut from flat sheets and must be formed into a generally spherical surface, significant wastage of reinforcing fabric is involved in conventional manufacturing techniques wherein the individual layers are superimposed and cut so as to fit a generally spherical mold.

Known plastic helmets of this type are usually finished with a peripheral edge strip of rubber. Normally this edge strip is glued onto the otherwise finished helmet, a relatively expensive and time-consuming procedure.

SUMMARY OF THE INVENTION

The present invention seeks to provide a protective helmet which overcomes the disadvantages of conventional protective helmets which are described hereinabove, and to provide a method of manufacturing such a helmet.

There is thus provided in accordance with an embodiment of the present invention a protective helmet comprising a multiplicity of partially overlapping layers of reinforcing material arranged about a center and moulded into a helmet configuration.

Further in accordance with an embodiment of the present invention, the multiplicity of partially overlapping layers defines a flower configuration of radially extending petals of reinforcing material. The reinforcing material typically comprises woven fibers impregnated with a plastic resin, each layer being of generally triangular configuration. The overlapping is such that at every location along the helmet there are provided at least three overlapping material petals. A plurality of petal layers may be incorporated in a single helmet.

Additionally in accordance with an embodiment of the present invention there is provided a method for producing a protective helmet comprising the steps of providing a multiplicity of generally triangular pieces of reinforcing material, arrangement of the triangular pieces in partially overlapping arrangement in a flower arrangement such that the exposed portion of the triangular piece defines

a petal extending radially from a center, sealing the triangular pieces in the flower arrangement adjacent the center; forming the flower arrangement into a helmet configuration by the application of heat and pressure in a helmet-shaped mold and trimming the outer edges of the flower arrangement to define the helmet edge.

Further in accordance with an embodiment of the present invention there are also provided the steps of providing an edging material of unvulcanized rubber onto the helmet edge and subsequently vulcanizing the edging material onto the helmet edge in an appropriate mold.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more fully understood and appreciated from the following detailed description taken in conjunction with the drawings in which:

Figure 1 is an illustration of a piece of reinforcing material used in the invention;

Figure 2 is an illustration of a flower constructed of a multiplicity of pieces of reinforcing material of the type illustrated in Fig. 1;

Figure 3 is an illustration of the flower formed into the shape of a protective helmet; and

Figure 4 a sectional illustration of a completed helmet having moulded in place edge rim.

DETAILED DESCRIPTION OF THE INVENTION

The helmet of the present invention and the method for its manufacture will now be described in detail with reference to the drawings. Fig. 1 shows a piece of reinforcing material used in the invention. According to a preferred embodiment of the invention the reinforcing material comprises KEVLAR (A Registered Trademark) manufactured by Du Pont of the U.S.A.. The Kevlar fiber is impregnated in a thermosettable resin such as a phenolic resin. The reinforcing material is received in web form and the pieces illustrated in Fig. 1 are cut therefrom. It is a particular feature of the present invention that the pieces shown in Fig. 1 can be cut from a standard web with relatively little wastage.

According to a preferred embodiment of the present invention the individual pieces of reinforcing material are cut in a generally triangular configuration with one partially curved corner indicated by reference numeral 10, one right angled corner 12 and a third corner 14.

According to a preferred embodiment of the invention (Fig. 2 a multiplicity of individual pieces of the configuration illustrated in Fig. 1 are arranged in a circular array about their respective corners 14 to form a "flower" and are sealed in a central area 16 as by a heat sealing press for maintaining the relative orientation of the various pieces in the flower. It

is appreciated that the individual pieces of material are arranged in a partially overlapping arrangement such that the exposed portion of each piece defines a "petal" extending radially outward from the center of the flower. The amount of overlap and the number of layers of material at any given location on the surface of the flower is determined for a given configuration of the material piece by the number of pieces that are incorporated into the flower. Thus a desired number of thicknesses in a given helmet can be realized by suitably choosing the number of pieces incorporated into the flower and thus the extent of their overlap. Also a plurality of flowers may be incorporated in a single helmet.

It is appreciated that although a particular configuration of material piece and a particular number of material pieces are shown in the drawings, the invention is not necessarily limited to such a configuration or number of pieces. Instead any suitable configuration and number of pieces may be employed.

The flower can be formed and sealed manually, or alternatively by semi-automatic or fully automatic machinery which may incorporate a jig for determining the placement of the individual material pieces as well as heat and pressure sealing apparatus.

Once the flower has been made it may be inserted into a female mold having the general configuration of a helmet to be produced. Fig. 3 illustrates the flower of Fig. 2 formed into the general shape of a helmet having protruding ear portions, it being appreciated that any suitable helmet shaped mold may be used. After one or more flowers have been inserted into such a mold, a male mold element is inserted on the opposite side of the flowers and suitable heat and pressure are provided under predetermined conditions for setting the binding resin and forming a helmet of desired shape as dictated by the mold.

Once the precursor of the helmet has been removed from the mold, the peripheral edges of the precursor are trimmed to provide a peripheral edge of uniform thickness. It is a particular feature of the invention that at this stage non vulcanized rubber or another material having similar characteristics is placed along the peripheral edge of the helmet precursor which is then placed in a mold. Suitable heat and pressure are then applied under predetermined conditions to cause the rubber or similar material to set and provide a molded-in-place rim bonded to the remainder of the helmet.

A completed helmet is illustrated in Fig. 4, in sectional illustration. In the illustrated embodiment in which three flowers of the type illustrated in Fig. 2 are employed, the helmet is formed of a total of 22 layers of reinforcing fabric and is formed with a molded-in-place rim 20 as described hereinabove.

It will be appreciated by persons skilled in

the art that the invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims which follow:

CLAIMS

1. A protective helmet comprising:
a multiplicity of partially overlapping layers of reinforcing material arranged about a center and molded into a helmet configuration.

2. A protective helmet according to claim 1 and wherein each of said layers comprises a generally triangularly shaped piece of reinforcing material.

3. A protective helmet according to claim 1 and wherein said multiplicity of partially overlapping layers defines a flower configuration of radially extending petals of reinforcing material.

4. A protective helmet according to any of the preceding claims and wherein said layers of reinforcing material are joined adjacent their center.

5. A protective helmet according to any of the preceding claims and wherein said overlapping layers are partially offset from each other by a uniform angle.

6. A protective helmet according to any of the preceding claims and wherein at least three layers of reinforcing material overlap at every location therealong.

7. A protective helmet according to any of the preceding claims and also comprising a molded-in-place rim formed of a thermosetting material.

8. A protective helmet according to any of the preceding claims and comprising a plurality of flower configurations according to claim 3.

9. A protective helmet according to any of the preceding claims and wherein said reinforcing material contains thermosetting resin.

10. A method for producing a protective helmet comprising the steps of:
providing a multiplicity of pieces of reinforcing material;

arranging the pieces of reinforcing material about a center in partially overlapping arrangement;

sealing the pieces together adjacent said center to maintain their relative arrangement; forming the sealed pieces into a helmet configuration in a helmet shaped mold; and trimming the peripheral edge of the sealed pieces to define helmet edge.

11. A method according to claim 10 and also comprising the steps of:

providing an edging of a thermosetting material at said peripheral edge; and causing setting of said thermosetting material to provide a molded-in-place edge for said helmet.

12. A method to either of claims 10 and 11 and wherein said forming step comprises

the step of applying heat and pressure to the sealed pieces.

13. A method according to any of claims 10-12 and wherein said pieces of reinforcing material comprise woven fibers and a thermosettable resin.

14. A method according to any of claims 10-13 and wherein said pieces of reinforcing material are of generally triangular configuration.

15. A method according to any of claim 10-14 and wherein said arranging step includes the step of arranging the pieces in a configuration of a flower having a plurality of radially extending petals defined by the exposed portions of said pieces of reinforcing material.

16. A method according to any of claims 11-15 and wherein said causing setting step comprises the step of placing the trimmed peripheral edge and thermosetting material into an edge mold.

17. A protective helmet constructed according to any of claims 1-16.

18. A method for producing a protective helmet according to any of claims 1-9 including the steps set forth in any of claims 10-16.

19. An article substantially as shown and described hereinabove.

20. An article substantially as shown in any of the drawings.

21. A method substantially as shown and described hereinabove.

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